

199-N-123 (C4955) Log Data Report

Borehole Information:

| | | | | | | |
|------------------------------------|-----------------|------------------------------------|------------------------------------|---------------------------|-------------|--|
| Borehole: 199-N-123 (C4955) | | | Site: 100 N Area | | | |
| Coordinates (WA St Plane) | | GWL¹ (ft): 17.35 | | GWL Date: 09/30/05 | | |
| North (m) | East (m) | Drill Date | Ground Level Elevation (ft) | Total Depth (ft) | Type | |
| Not available | Not available | Sep/05 | Not available | 50 | Cable | |

Casing Information:

| Casing Type | Stickup (ft) | Outer Diameter (in.) | Inside Diameter (in.) | Thickness (in.) | Top (ft) | Bottom (ft) |
|--------------------|---------------------|-----------------------------|------------------------------|------------------------|-----------------|--------------------|
| Threaded Steel | 1.15 | 11 3/4 | 10 1/4 | 3/4 | +1.15 | 51 |

Borehole Notes:

Casing diameter and casing stickup measurements were acquired by the logging engineer using a caliper and steel tape. Measurements were rounded to the nearest 1/16 in.

Zero reference is the ground surface. Depth to groundwater was measured by the logging engineer with an e-tape.

Driller reports open hole below 51 ft.

Logging Equipment Information:

| | |
|---------------------------------------------|--------------------------------------------------|
| Logging System: Gamma 4E | Type: SGLS (70%) SN: 34TP40587A |
| Effective Calibration Date: 12/21/04 | Calibration Reference: DOE/EM-GJ854-2005 |
| | Logging Procedure: MAC-HGLP 1.6.5, Rev. 0 |

| | |
|---------------------------------------------|--------------------------------------------------|
| Logging System: Gamma 4M | Type: NMLS SN: H340207279 |
| Effective Calibration Date: 03/24/05 | Calibration Reference: DOE/EM-GJ856-2005 |
| | Logging Procedure: MAC-HGLP 1.6.5, Rev. 0 |

Spectral Gamma Logging System (SGLS) Log Run Information:

| Log Run | 1 | 2 Repeat | | | |
|-------------------|----------|-----------------|--|--|--|
| Date | 09/30/05 | 09/30/05 | | | |
| Logging Engineer | Spatz | Spatz | | | |
| Start Depth (ft) | 49.5 | 14.5 | | | |
| Finish Depth (ft) | 0.5 | 7.5 | | | |

| Log Run | 1 | 2 Repeat | | | |
|--------------------------|--------------------------|--------------------------|--|--|--|
| Count Time (sec) | 100 | 100 | | | |
| Live/Real | R | R | | | |
| Shield (Y/N) | N | N | | | |
| MSA Interval (ft) | 1.0 | 1.0 | | | |
| ft/min | N/A ² | N/A | | | |
| Pre-Verification | DE921CAB | DE921CAB | | | |
| Start File | DE921000 | DE921050 | | | |
| Finish File | DE921049 | DE921057 | | | |
| Post-Verification | DE921CAA | D921CAA | | | |
| Depth Return Error (in.) | 0 | 0 | | | |
| Comments | No fine gain adjustment. | No fine gain adjustment. | | | |

Neutron Moisture Logging System (NMLS) Log Run Information:

| Log Run | 3 | 4 Repeat | | | |
|--------------------------|----------|----------|--|--|--|
| Date | 09/30/05 | 09/30/05 | | | |
| Logging Engineer | Spatz | Spatz | | | |
| Start Depth (ft) | 16.5 | 14.5 | | | |
| Finish Depth (ft) | 0 | 7.25 | | | |
| Count Time (sec) | N/A | N/A | | | |
| Live/Real | R | R | | | |
| Shield (Y/N) | N/A | N/A | | | |
| Sample Interval (ft) | 0.25 | 0.25 | | | |
| ft/min | 1.0 | 1.0 | | | |
| Pre-Verification | DM042CAB | DM042CAB | | | |
| Start File | DM042000 | DM042067 | | | |
| Finish File | DM042066 | DM042096 | | | |
| Post-Verification | DM042CAA | DM042CAA | | | |
| Depth Return Error (in.) | 0 | 0 | | | |
| Comments | None | None | | | |

Logging Operation Notes:

Logging was conducted with centralizers on the sondes. Repeat sections were collected in this borehole to evaluate system performance.

Analysis Notes:

| | | | | | |
|-----------------|--------|--------------|----------|-------------------|------------------------|
| Analyst: | McCain | Date: | 10/17/05 | Reference: | GJO-HGLP 1.6.3, Rev. 0 |
|-----------------|--------|--------------|----------|-------------------|------------------------|

Pre-run and post-run verifications for the logging systems were performed before and after the day's data acquisition. The acceptance criteria were met.

A casing correction for 0.75-in.-thick casing was applied to the SGLS log data. There is no valid calibration for the neutron moisture data in a 10-in. borehole. Therefore, the data are plotted in counts per second (cps) and no correction factors are applied.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G4EApr05.xls using efficiency functions and corrections for casing, water, and dead time as determined from annual calibrations. No corrections for dead time were necessary. A correction for water inside the casing is applied to the data below 17.35 ft.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclides (^{60}Co and ^{137}Cs) detected in the borehole, naturally occurring radionuclides (^{40}K , ^{238}U , ^{232}Th [KUT]), a combination of man-made, KUT, total gamma and moisture, total gamma plotted with dead time, and moisture. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, casing corrections, or water corrections. Repeat section plots are provided where appropriate.

An additional plot is provided for shape factor analysis (see below).

Results and Interpretations:

^{137}Cs and ^{60}Co were detected in this borehole. ^{137}Cs was detected at isolated depths at the MDL. These are statistical fluctuations and do not represent valid detections. ^{60}Co was detected from 10.5 to 13.5 ft, with a maximum concentration of about 0.28 pCi/g. It is possible that the ^{60}Co co-exists with ^{90}Sr .

A limited shape factor analysis was performed to detect the presence of bremsstrahlung associated with ^{90}Sr . Previous experience in a borehole in the 241-B Tank Farm indicated that variations in SF2* may be diagnostic of ^{90}Sr at concentrations above about 500 pCi/g (McCain and Koizumi 2002). SF2* is defined as the ratio between total counts in the 60 to 350 keV range divided by total counts in the 350 to 650 keV range. In the absence of contamination, SF2* typically assumes a value between 3.3 and 3.7, and increases to values greater than 6 in intervals with high ^{90}Sr concentration. For ^{90}Sr concentrations between 500 and 1000 pCi/g, SF2* values are transitional between 3.7 and 6. In this borehole, SF2* varied from about 2.8 to 3.8, with a maximum value of about 4.2 near the bottom of the hole. Thus, the shape factor analysis fails to provide any evidence of ^{90}Sr . This may be due to the effects of relatively thick casing. The casing thickness for well C3360 in the B Tank Farm was 0.5 in., while this borehole has a casing thickness of 0.75 in. The effects of casing thickness on SF2* are not known.

The repeat sections generally indicate good agreement of the naturally occurring KUT and moisture.

References:

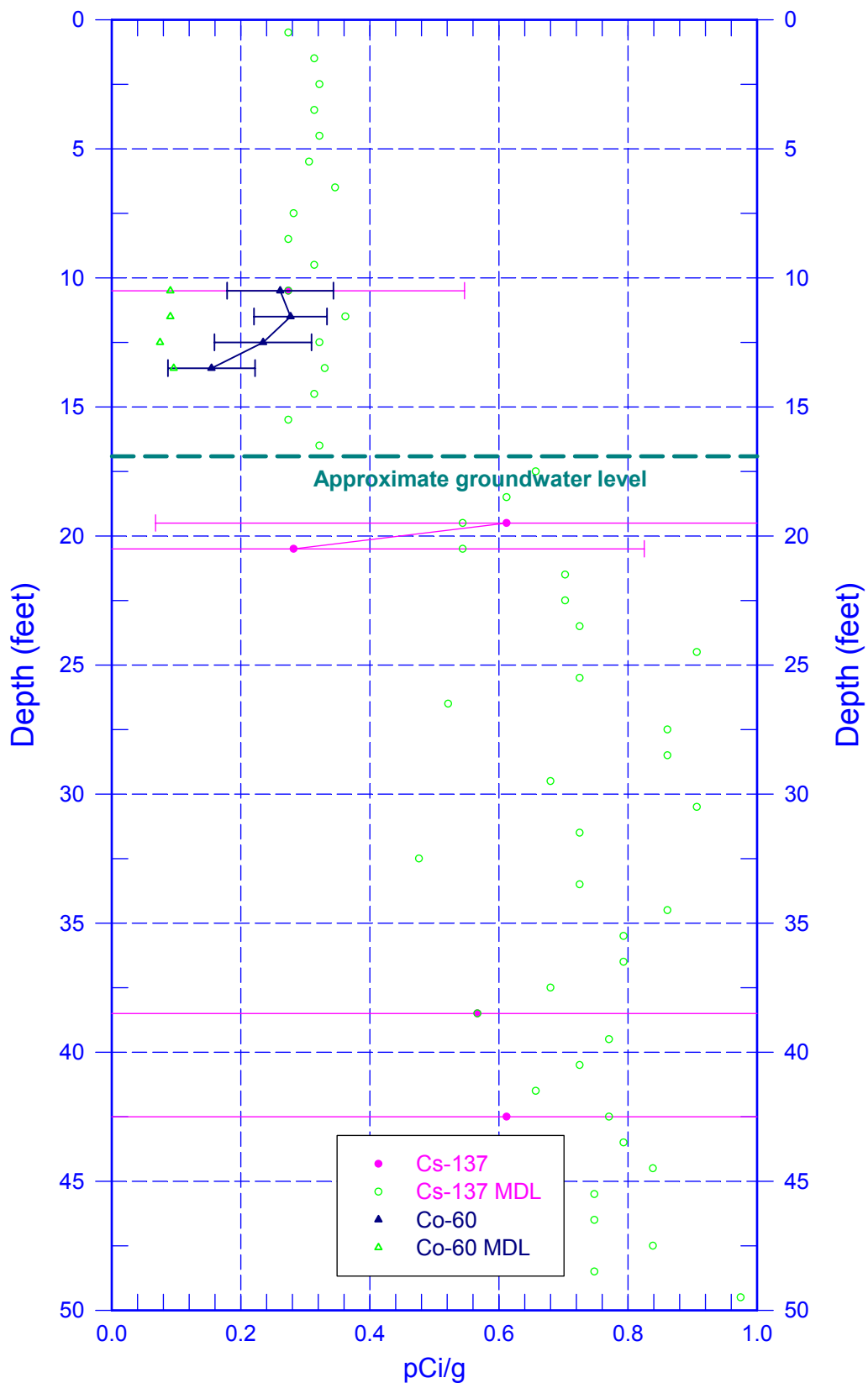
McCain, R.G. and C. J. Koizumi, 2002; *Correlation of Spectral Gamma Log Response and Sr-90 Concentrations for a Steel-Cased Borehole*; GJO-2002-322-TAR; prepared by MACTEC ERS for the Grand Junction Office, Grand Junction, Colorado.

¹ GWL – groundwater level

² N/A – not applicable

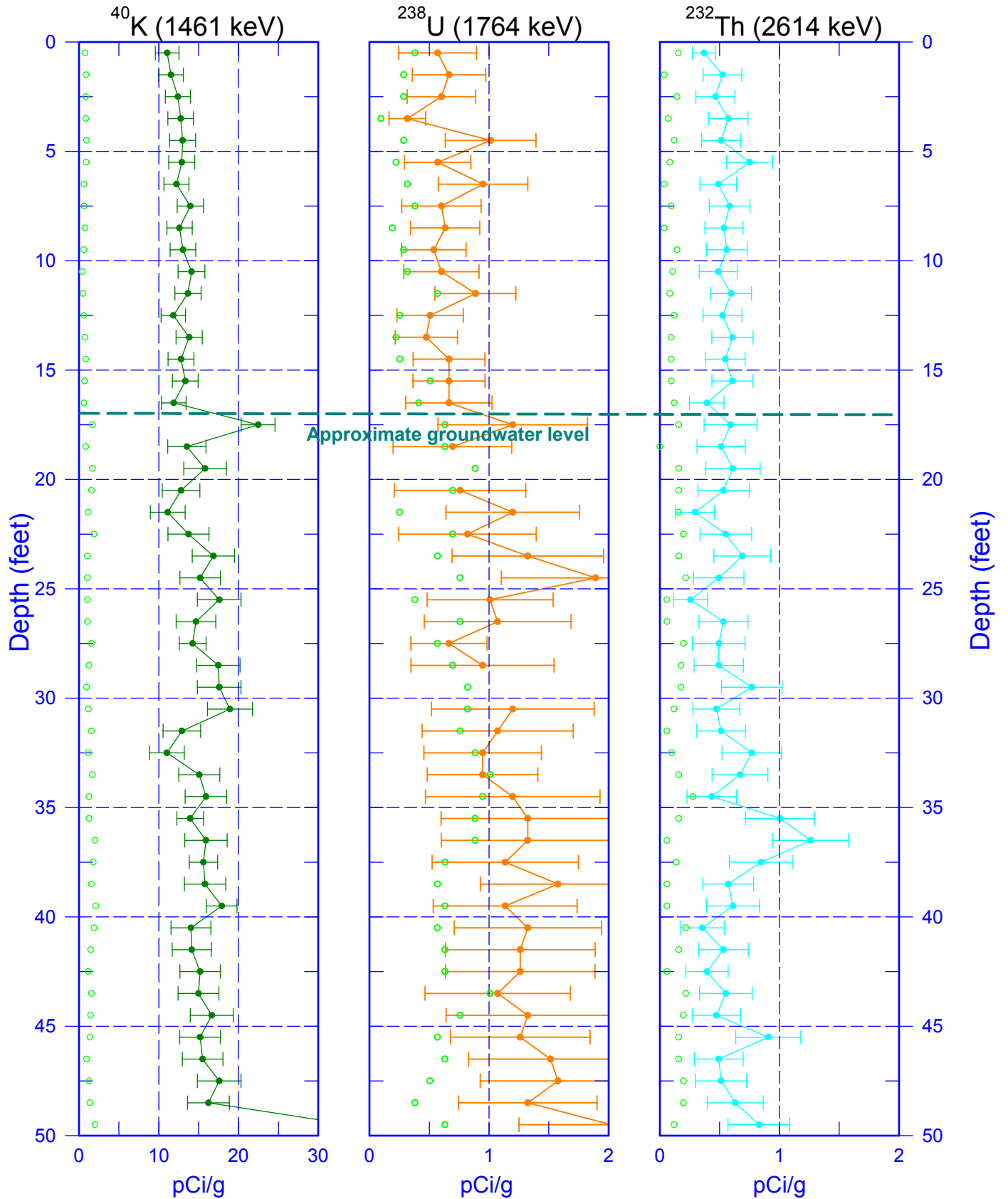
199-N-123 (C4955)

Man-Made Radionuclides



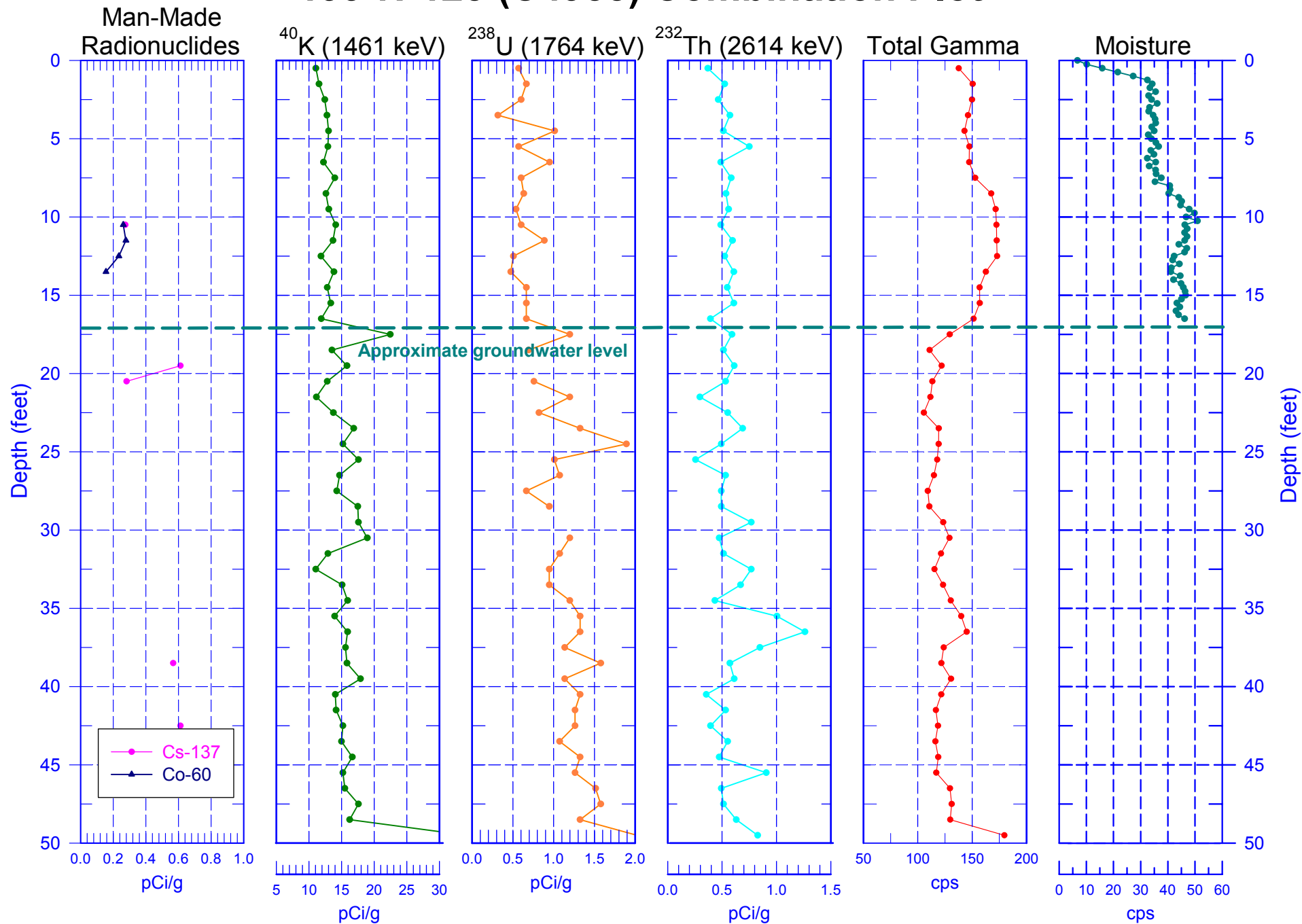
Zero Reference - ground surface

199-N-123 (C4955) Natural Gamma Logs



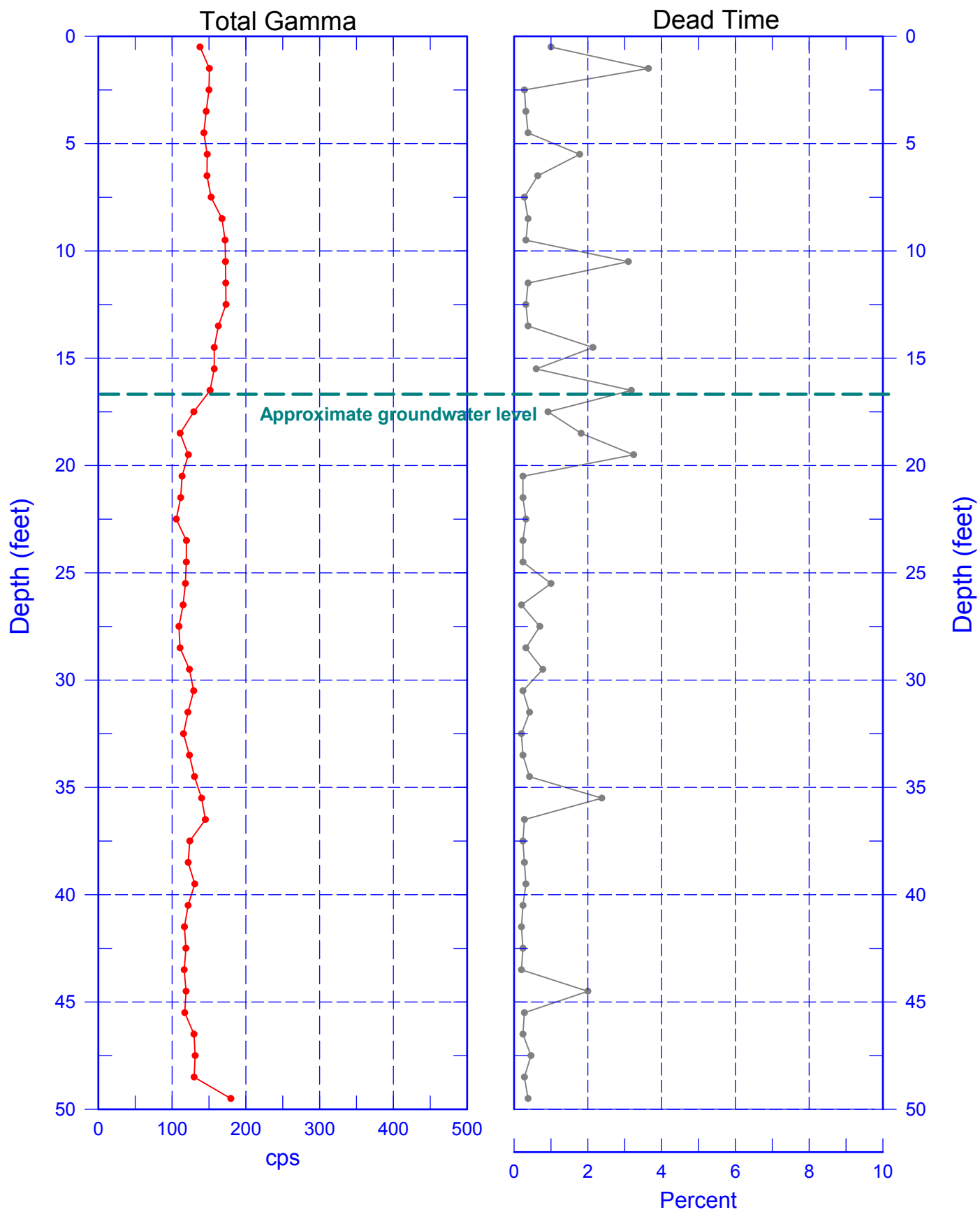
Zero Reference = ground surface

199-N-123 (C4955) Combination Plot



199-N-123 (C4955)

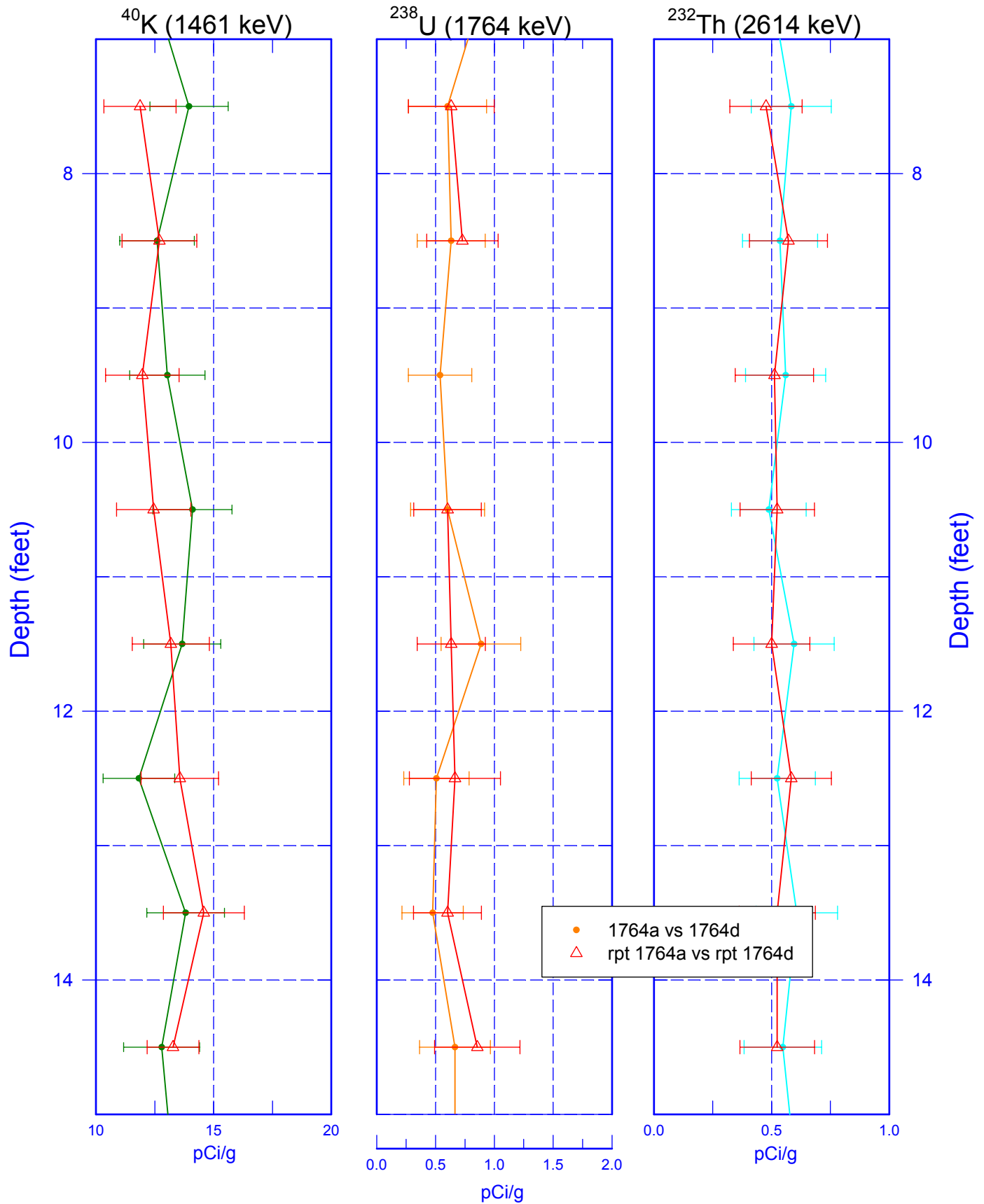
Total Gamma & Dead Time



Reference - ground surface

199-N-123 (C4955)

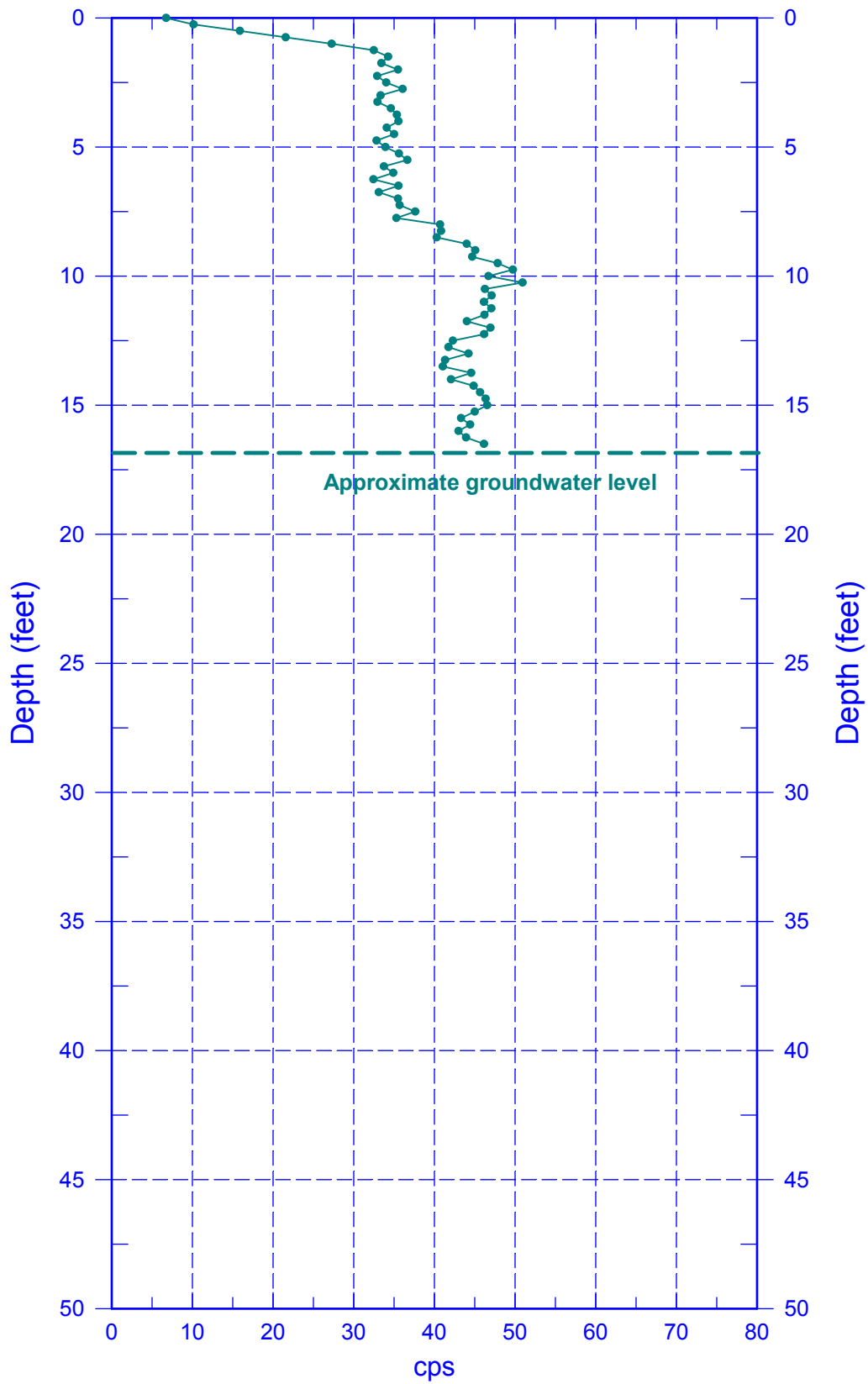
Repeat Section of Natural Gamma Logs



Zero Reference - ground surface

199-N-123 (C4955)

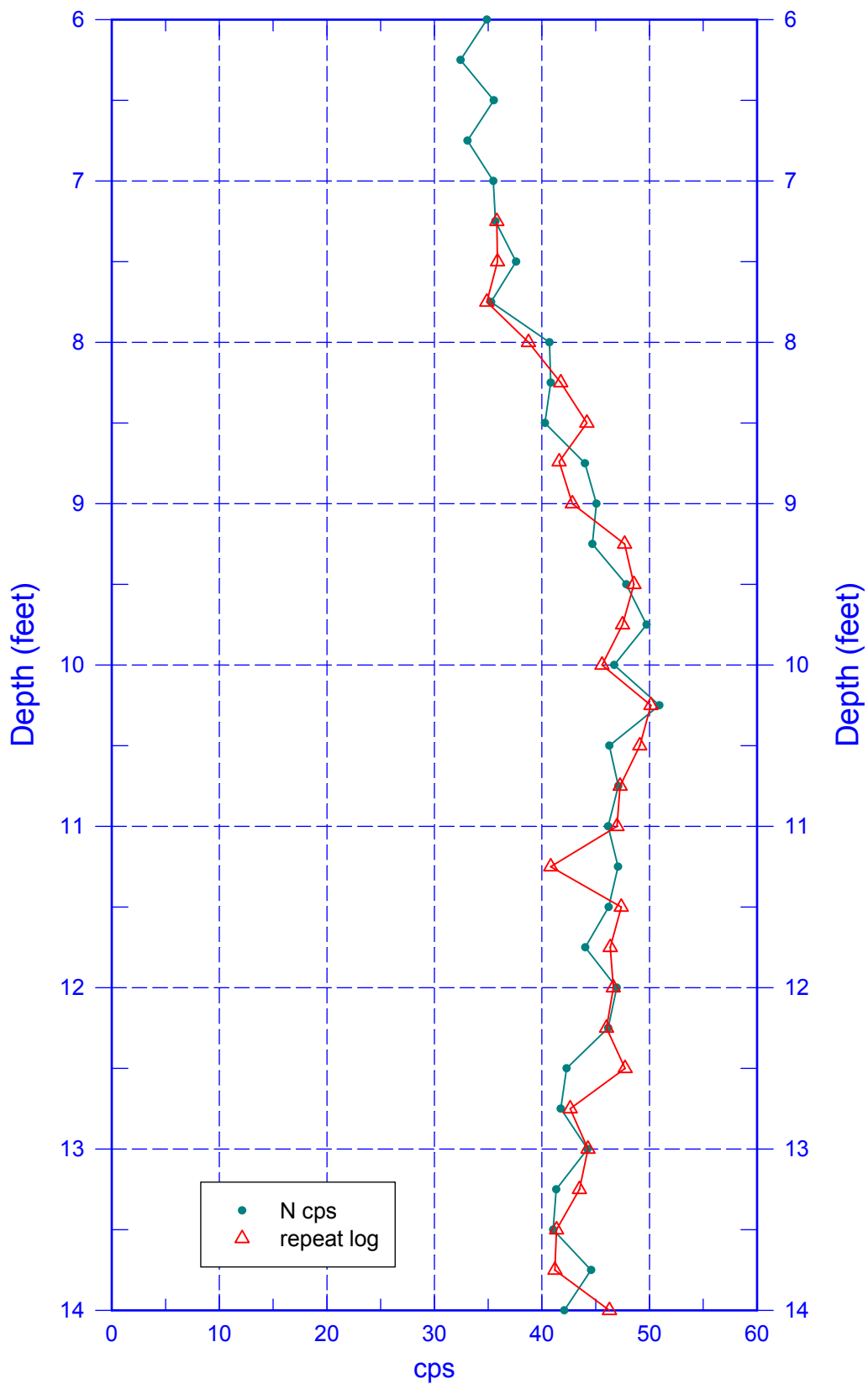
Neutron Moisture



Zero Reference - ground surface

199-N-123 (C4955)

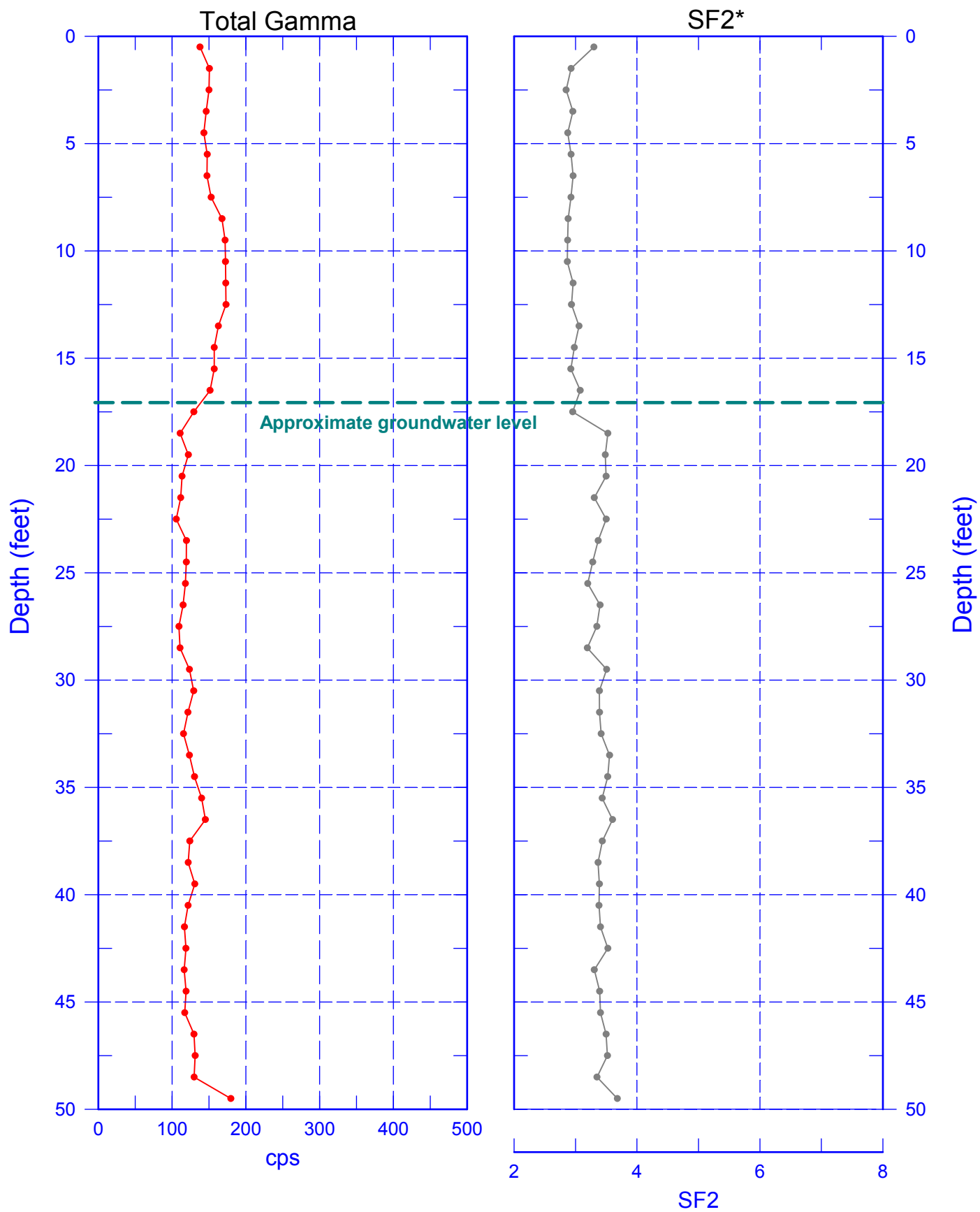
Moisture Repeat Section



Zero Reference - ground surface

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Shape Factor (60-350)/(350-650)



Reference - ground surface